or visceral condition not yet fully developed. In many instances further symptoms may occur, and a cardiac, renal, gastric, aural, or local cerebral cause may be recognized. Sometimes, however, such symptoms recur repeatedly and no further developments take place until perhaps with increasing cerebral sclerosis more distinct results follow.

Psychic Manifestations of Cerebral Arteriosclerosis. Alienists have recently taken into account far more than formerly the importance of the circulatory conditions in the brain in the development of psychoses. Barret[2] has published a study of the subject, and quotes largely from Alzheimer and Binzwanger, both of whom have contributed notably to it. Among the distinctive types of mental disease in which arteriosclerosis is recognized as an important pathological lesion are mentioned general paralysis, arteriosclerotic dementia, and, less certainly, senile dementia. Among the special symptoms in the different groups are mental fatigue, headaches, dizzy attacks, memory weakness, psychical phenomena with progressive dementia, fainting, apoplectiform seizures, and epileptiform convulsions. Aphasia, periods of excitement, and mental confusion are characteristic of some. In Barret's group of cases the loss of retentive memory was among the earliest symptoms. Later, inclination to fabulate, loss of judgment, disorientation, narrowing of the external interests, episodes of confusion and hallucinatory delirium, etc., followed more or less quickly. These briefly cited references indicate the kind and variety of symptoms as they present themselves to the alienist. The general clinician will find among them the extremes of many of the isolated symptoms presented by senile or even presenile arteriosclerotics who happily never advance to these unfortunate grades of cerebral disease.

ARTERIOSCLEROSIS IN THE YOUNG.

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In 1890 I attended, at St. Augustine, a male mulatto, aged thirty-two years, who was suffering from obliterative endarteritis with gangrene of the toes, requiring amputation. His skeletal arteries were sclerosed and beaded. He gave a history of luetic infection in his eighteenth year. As to other infections I am not able to speak.

During the period of service on this man my attention was drawn to his son, a boy aged twelve years, who by his pinched and haggard appearance, by his complexion, figure, and carriage, suggested an aged man rather than the freshness of youth. Examination revealed diffuse sclerosis in all palpable arteries, with calcification quite as advanced as that of his parent; the beading could not have been further exaggerated at any stage of life. Evidences of heart or kidney disease were absent. The boy was mentally bright, but physically stunted, frail, thin in flesh, and without muscular development. This case of general arteriosclerosis in a boy of twelve years was apparently due to congenital syphilis.

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[2] Amer. Journal of Insanity, 1905, No. 1.

FREQUENCY. Isolated references to arteriosclerosis in the young appear in literature from early in the last century; the earliest with which I am acquainted being that of Portal,[1] in 1803, who states that "rarely the vessels of young persons become ossified; however, we find ossifications in the arteries of some children whose ossifications are not far advanced." Scarpa,[2] in 1819, writes: "Ossification of the arteries cannot be said to be proper to old age, since it is sometimes met with in patients who are not much advanced in life," and Hodgson,[3] in 1815, says his "friend Young possesses the temporal artery which he removed from an infant fifteen months old, in which the coats of the vessel are converted into a complete tube of calcareous matter."

Henoch regards pathological changes in the heart not more rare in children than in adults, but changes in the larger vessels uncommon. Virchow speaks of the importance of arterial degeneration in children, and Gerhardt considered it rare in children, largely because of lack of observation.

Seitz[4] in 148 cadavers observed at the Munich Pathological Institute found 10 cases between ten and twenty-nine years, and in over 2000 autopsies found numerous cases between the ages of seventeen and twenty-five years. Waldstein[5] in 102 examinations found 8 examples between seventeen and twenty years.

Schott[6] has found arteriosclerosis with aortic stenosis at the age of sixteen. Martin[7] has seen aortitis frequently after the first year, but never disease in the middle-size branches before the twentieth year.

Romberg[8] says that in Germany the disease augments with rapidity after the fifteenth year. In 1477 sections on all ages and conditions he found 2 instances between one and fourteen years, and 5.88 per cent. between fifteen and nineteen years with walls diffusely thickened; he calls attention to the remarkable thickening and stiffening which he has observed clincially, without nephritis or rise of blood pressure in children twelve to sixteen years of age. Marchand,[9] Bäumler,[10] and Kaigi-Sawada[11] have lately referred to diffuse hypertrophy of the walls of the whole peripheral system without nephritis, in young persons. Roger,[12] in 98 cases of aortic aneurysm, found but 1 under twenty years, and of 59 abdominal aneurysms none under twenty years. Holmes[13] tabulated 13 instances of intracranial aneurysm in children, and Parker,[14] Crisp,[15] Jacobi,[16] and Keen[17] have cited numerous extracranial aneurysms in the young, a majority of which, however, on investigation are dependent upon trauma, infective embolism, or erosion by contiguity with abscess cavity. Camac,[18] from hospital records, concludes that "arterial disease in children under six years, even those who are victims of congenital syphilis, is practically unknown; in those from six to fifteen years it is rare," and, in the examination of records of 799 autopsies in children dying in the New York Foundling Hospital, finds no case of aneurysm between one and ten years. Camac, from 340 autopsy reports of aneurysm in the literature, finds in the first five years of life 2 cases; in the second five years, 3 cases, and in the second decade, 27 cases. Holt[19] has seen cerebral hemorrhage in a child of two months.

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[1] Cours d'Anatomie Méd., 1803, iii, 133.
[2] On Aneurysm, Wishart's transl., 1819, p. 89.
[3] Diseases of Arteries, etc., 1815, p. 23.
[4] Verhandl. d. Gesell. f. Kinderh., 1896, xiii, 177.
[5] Cited by Seitz.
[6] Verhandl. des Kong. f. in. Med., 1904, p. 143.
[7] Bull. soc. anat. de Paris, 1826, ii, 17.
[8] Handb. d. prak. Med., Bd. i, p. 755; Verhandl. des Kong. f. in. Med., 1904, p. 60.

Not until the recent thorough studies of the minute pathology of arteriosclerosis by Ortner,[20] Flexner,[21] Thayer,[22] Symnitzky,[23] and Wiesel[24] has the frequency and import of arteriosclerosis in the young been realized. By their work light is thrown upon previously reported cases and the relation of the acute infections to arterial disease has been established. Thayer, in a study of 189 persons long recovered from typhoid fever, states that "between the ages of ten and fifty years, 48.3 per cent. of old typhoids showed palpable arteries, as compared with 17.5 per cent among ordinary healthy individuals." Symnitzky, in 138 autopsies on persons under twenty-five years, dying of various acute infections, found sclerotic changes in the aortic wall in 38, or 27.5 per cent. Excluding cases under two years, in which it did not appear in this series, his records show aortitis in 48 per cent. of cases examined. Wiesel, from 300 autopsies of the young dying at the height of various infections, records greater or less pathological processes in the arterial coats of nearly all cases.

Etiology. Osler states: "that heredity plays a most important role is shown in the cases in which arteriosclerosis sets in early in life in individuals in whom none of the recognized etiological factors can be found." Seitz regards heredity and individual predisposition in the non-syphilitic important factors in childhood. Klebs[25] saw thin vessels in a child of thirty-two weeks. Balassa,[26] Gull,[27] and Webber[28] speak of congenital atrophy of the coats. Cruveilhier[29] described a case of aneurysm with congenital thinness of the media. Eppinger[30] reports 2 cases with anatomical wall deficiency; Dieulafoy,[31] a case of infantile cerebral hemorrhage with similar conditions. Brill and Libman[32] report a girl of fourteen years with marked family tendency to arteriosclerosis, with no history of congenital syphilis or acute infection, who died of hemiplegia. Autopsy revealed general arteriosclerosis with interstitial nephritis. The scleroses were especially located in the aorta, coronary and superior mesenteric arteries, with calcific deposits in the vessels of liver and kidneys, and here and there points of obliterative arteritis. All causes other than heredity appear to have been eliminated.

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[9] Verhandl. d. Kong. f. in. Med., 1904, pp. 23 and 48.

[10] Münch. med. Woch., 1898, v, 133.

[11] Deut. med. Woch., 1904, xxx, 425.

[12] Bull. soc. med. des hôp. de Paris, 1863, p. 499.

[13] Lancet, 1873, i, 236; System of Surgery, second edition, iii, p. 421.

[14] Trans. Med. Chir. Soc., London, lxvii, 51.

[15] Diseases of Bloodvessels, 1847, p. 75.

[16] Arch. Pediat., 1890, vii, 161.

[17] Med. News, 1887, li, 725.

[18] Amer. Jour. Med. Sci., 1905, cxxix, 845.

[19] Dis. Inf. and Childhood, 1906, 800.

[20] Zeit. f. Heilk., 1905, vi, 121, 174, 183.

[21] See Thayer: New York State Jour. Med., 1903, iii, 21.

[22] Amer. Jour. Med. Sci., March, 1904.

[23] Zeit. f. Heilk., 1903, xxiv, abth. f. Path. Anat., iv, p. 177.

[24] Zeit. f. Heilk., 1906, xxvii, 161.

The role of congenital syphilis has apparently been somewhat overestimated in youthful cases by earlier writers who were not aware of the part which the acute infections play in the production of focal necroses, preparing the soil for future gross lesions of greater or less moment. It has frequently been accepted without question that luetic infection is the chief factor in the production of aneurysm; hence some interest attaches to the collection which I have gathered of 46 aneurysms, at or under twenty years, clearly to be attributed to local arteriosclerosis.

The histories of these precocious cases make mention of syphilis in 12 instances, it being negative 11 times and positive once. Among 144 individual reports of juvenile arteriosclerosis collected from earlier literature, nearly all with imperfect histories, I find reference in 55 instances to congenital syphilis; it appears as a positive cause in 10, and is negative in 45 records.

Sonnenberg[33] notes 2 fatal bleedings in congenital syphilitics, after ritual circumcision on the eighth day of life, in both of whom he found arteriosclerosis of the cut vessels. Hochsinger,[34] in dissections of livers of the congenitally syphilitic, found disease of the arterioles in 5 instances.

In Symnitzky's 38 young cases, syphilis is negative, and in Wiesel's 80 detailed cases of arteriosclerosis autopsied during the active stage of acute infections syphilis does not enter as a possible factor. In adult life, however, the causative ratio rises much higher. Chiari,[35] in the study of a large number of syphilitic infections shows that mesarteritis was present in one-half of the cases.

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[25] Cited by Jacobi, Arch. Pediat., 1890, vii, 161.
[26] Cited by Jacobi, ibid.
[27] Cited by Jacobi, ibid.
[28] Cited by Jacobi, ibid.
[29] Anat. Path., liv, i, 15.
[30] Arch. f. klin. Chir., 1887, iv.
[31] Gaz. hebdom., 1887, xvi, xviii.
[32] Jour. Exper. Med., 1899, iv, 5.
[33] Verhandl. d. Gesellsch. f. Kinderh., 1896, xviii, 177.
[34] Verhandl. d. deut. Path. Gesellsch., 1899, ii.
[35] Ibid., p. 182.

Hoffbauer,[36] investigating nodular and diffuse arteriosclerosis of the tuberculous, says he "can find no pathological difference in the arterial wall between tuberculosis and nephritis" and remarks that "it is necessary for the future to give up the causal connection between blood pressure and arterial thickening." Remlinger,[37] 1905, reviewing Romberg's juvenile cases says: "Concerning the cause of so-called diffuse arteriosclerosis in the young nothing is known."

Camac, in extensive researches of hospital reports, attributes about 32 per cent. of adult aneurysms to syphilis; about 16 per cent. to tuberculosis. From his analysis of 3954 necropsies he concludes that aneurysm is three to four times as common in the colored as in the white race. From my group of non-luetic aneurysms I cull a few unique examples. Phänomenow[38] refers to an infant stillborn at seven months, with aneurysm of the abdominal aorta and local endarteritis, the abdominal circumference measuring 15¾ inches, producing dystocia. Martin saw aneurysm of the ductus arteriosus in an infant of one month. Roger made a section on a child of ten years, with negative history, barring suffocative and cyanotic seizures, revealing aneurysms of the transverse aorta. Eppinger reports a girl of ten years, without infection, with aneurysm of the right and left coronary and the intercostal arteries at their origin. Comby[39] speaks of a girl of fourteen years, who, after two attacks of acute articular rheumatism, died of aortic aneurysm.

I wish also to call attention briefly to a very few suggestive examples of apparently non-syphilitic arteriosclerosis in the young, from earlier literature. Durant[40] reports congenital arteriosclerosis in an infant of premature birth, who on the sixth day died of peritonitis incident to umbilical infection. The lesions were of a chronic character, being pronounced calcareous degeneration of the media of the aorta and pulmonary arteries. Henning[41] reports a case of congenital changes in the aorta and heart valves, in a fœtus whose mother, during pregnancy, had an attack of acute articular rheumatism. Haussman[42] described a case of fatal aortitis in a fœtus. Goodhart[43] refers to a male infant of two months, with congenital calcification uniformly distributed around the mitral orifice. Meigs[44] examined an infant of five months dying of marasmus, whose only pathological lesion was sclerosis in the left coronary artery, near its origin. Ballantyne[45] mentions great atheromatous changes in the aorta and pulmonary arteries in a fœtus of eight months. Fischel[46] had a case of endarteritis in a child of five months. Moutard-Martin[47] reports a

[36] Zeit. f. Heilk., 1906, xxvii, 161.

[37] Zur Statistik der Arteriosklerose, Marburg, 1905.

[38] Arch. f. Gynäk., 1881, xvii, 133.

[39] Bull. de la Soc. pediat. de Paris, 1906, ii, 11.

[40] Bull de la Soc. anat. de Paris, 1899, lxxiv, 97

[41] Jahr. f. Kinderheilk., xxx.

[42] Monatsch. f. Geburtskrank., 1869.

[43] Diseases of Children, 1894, p. 612.

[44] Trans. Col. Phys., Phila., 1889, 3 S., xi, 159.

[45] Manual Antenatal Path., Edinburgh, 1902.

[46] Biedert's Handb. d. Kinderheilk., 1902.

[47] Bull. Soc. anat. de Paris, 1875, xii, 775.

child, without kidney involvement or luetic infection, dying of smallpox. The autopsy revealed aortic plaques and the aortic valves covered with calcific incrustations. Andral[48] found calcific plaques in the aorta of a girl of eight years, and Brooks[49] observed coronary sclerosis in a boy of fifteen years.

Realizing how few autopsies in children have included thorough investigation of the vascular system, it becomes apparent that my collection of 146 cases, comprising a careful review of the literature up to near the present time, must represent a very small minority of cases in which such lesions have actually occurred, and this is abundantly proved by examination of recent work.

Heart lesions associated with acute infections have received much attention in the past, but the arteries have been neglected.

In 1902 Flexner made an autopsy on a man from Dr. Osler's service, twenty-two years of age, dying on the ninth day of typhoid fever, from thrombosis in the left middle cerebral artery. I quote Flexner's pertinent record of sections through the cerebral vessels in this case: "These show evidence of a most extensive arteritis. In the less affected parts of the vessel wall the muscular coat takes on a very pale stain, while in many places the fibers, which seem swollen, are separated by vacuolic spaces. At some points these are so numerous that the tissue has an almost reticulated appearance, consisting of a loose, wavy, palely staining material in which traces of elastic tissue may still be seen, and containing numerous larger and smaller clear spaces. The muscle nuclei are in many instances swollen and deformed. The internal elastic membrane has in a great part disappeared. In many places the distinction between the individual coats of the artery is wholly lost, the entire wall being infiltrated with a mass of cells the nuclei of which are extensively fragmented." Flexner concludes: "When one considers the brief duration of the clinical symptoms, the character of the thrombi (of undoubted agglutinative origin), and the extent of the vascular changes, together with the fact that these changes are also visible in vessels in which no thrombus has occurred, it would seem clear that the arteritis was the earlier change." Thayer regards it "natural to suspect that they (arterial lesions) are a result of an acute localization of *Bacillus typhosus* or of some secondary infectious agent in the walls of the vessel." Thayer[50] conceives the role of the acute infections as important in the production of focal degenerations which constitute an important element in arteriosclerosis.

Among 52 autopsies observed by Thayer and Brush,[51] death being caused by typhoid fever, sclerotic changes were observed in the aortæ of 30 (fresh lesions in 21), while among 62 examinations of the coronary arteries of subjects dead of typhoid fever "19 had definite sclerotic changes and in 4 more yellow opacities of the intima were observed." This thorough investigation of the vascular effects of typhoid fever was soon followed by the valuable paper of Symnitzky. Of his 38 subjects, dead from various acute infections, 24 were under twenty years of age, and I have selected this group for brief analysis. They comprise 4 cases of pneumonia, 3 of typhoid fever, 2 of tuberculosis, 2 of scarlatina, and 1 each of scarlet fever followed by nephritis, tuberculous meningitis, acute endocarditis, chronic endocarditis, typhoid fever complicated by pneumonia, cerebral sclerosis with epilepsy, tuberculosis with epilepsy, diphtheria complicated by measles and pneumonia, acute rheumatic arthritis, pyemia, chronic nephritis and peritonitis, in all of which the lesions noted were in the aorta, in 3 instances extending to its larger branches. None gave a history of syphilis, 1 of alcohol. In 9 the history was quite negative; in 15 there had been acute or chronic illness in earlier life, to which it would seem the findings might be attributed in about equal probability with the terminal malady. In 3 of Symnitzky's cases there was disappearance of the elastic elements with proliferation of the medial connective tissue; in 11 there was proliferation of the connective tissue and the elastica; in 2 only changes in the adventitia, being small round-cell infiltration around the vasa vasorum. In the same case he occasionally found different pictures of sclerosis in various stages. It is to be mentioned that among the 24 selected cases the heart was diseased eleven times, simple hypertrophy twice, hypertrophy with dilatation once, and valvulitis eight times, representing 45.9 per cent. with cardiac involvement.

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[48] Précis d'Anat. Path., 1829, ii, 380.

[49] Amer. Jour. Med. Sci., 1906, cxxxi, 778; New York Med. Jour., October 27, 1906, p. 825.

[50] New York State Jour. of Med., 1903, iii, 21.

[51] Jour. Amer. Med. Assoc., 1904, xliii, 726.

The latest and most extensive investigation of the influence of acute infections is the work of Wiesel, published in July, 1906. This requires somewhat detailed study. The number of autopsies made was 300, being the product of three years of Kretz's service at the Franz Josef-Spital, Vienna. The 80 reported cases represent a highly refined study of the beginnings of arteriosclerosis. The subjects were young, many of them infants, and macroscopic and microscopic observations were taken upon central and peripheral vessels at the beginning or height of fatal illness from diphtheria, scarlatina, measles, pneumonia, influenza, sepsis and pyemia, osteomyelitis, suppurative otitis, typhoid fever, cerebrospinal meningitis, mushroom poisoning, and other conditions. Wiesel has furnished notes of 20 cases of diphtheria, 20 of scarlatina, and 40 of other infections, in all of which, without reference to the character of the infection, similar degenerative changes are described, modified only by the length of the infective influence.

Macroscopic changes appeared occasionally, usually between the sixth and the tenth day, as minute yellowish patches in the aorta, carotids, and coronaries, and in a few instances minute projections of calcareous deposits were visible, which Wiesel regards as a postinfectious process initiating true arteriosclerosis. In the histological examinations remarkable microscopic degenerative changes were almost constant, not only in the large trunks, but in the end arteries and even in the intestinal vessels. Usually before the fifth day Wiesel states that serous infiltration of the vessel media occurs, vacuoles appear between muscle fibers, fibers are contracted and elastic lamellæ separated by a homogeneous substance which takes the stain badly, and within which appear occasional leukocytes. At this stage the elastic fibers are displaced, but no ruptures appear. The endothelium at this stage is unchanged. From the eighth to the tenth day occurs the pathological climax, rupture of elastic fibers and necrosis of the musculature. Occasionally the intima is involved. Changes are greater and earlier in the peripheral arteries. Wiesel admits uncertainty as to the ultimate fate of these acute vessel changes, but believes regenerative changes take place. In some instances a few weeks advanced, he observed new elastic fibers from the intact adventitia growing into the partially destroyed media. He reports a typhoid fever subject who, three months after recovery, died from another disease, in which new tissue growth appeared in the media of the aorta and some of its branches. In 4 cases of death about one year after recovery from diphtheria, the only abnormality consisted in unusual appearance of elastic fibers and frequent replacement of muscle elements of the media by fibrous tissue. Advanced medial necroses may continue progressively, involving the intima and developing postinfectious atheroma, and local and general arteriosclerosis, with their sequels.

There is a striking similarity between the changes in the media and such as are produced artificially by the subcutaneous or intravenous injection into rabbits of adrenalin and various other toxins. Pearce and Baldauf[52] have lately reported lesions by single injections of adrenalin.

Equally interesting are the sections of bloodvessels in persons dying from uncinariasis. Through the courtesy of Dr. Baily K. Ashford, whose work in Porto Rico is well known, I have been able to learn of his unpublished studies on the bloodvessels in this disease and to examine sections of arteries and of the liver, kidney, spleen, and skeletal vessels presenting characteristic diffuse fibroid degenerations of the media of the very young as well as middle-aged subjects. I myself have seen popliteal aneurysm in a case of uncinariasis and Claytor[53] reports cerebral hemorrhage from the same cause.

In the previously detailed cases there appears a remarkable uniformity in pathological changes in a great variety of conditions. Evidences of restitution of integrity were apparent in the cases of longer duration. How permanent the damage may be in patients who survive the initial disease is not established; diffuse fibroid degeneration in the media would affect unfavorably the nutrition of the intima and lead to the early development of general arteriosclerosis or to atheromatous plaques and possibly aneurysm. The frequency of palpable arteries after typhoid fever, previously mentioned, would thus be explained. The findings of Flexner in typhoid fever, and of Wiesel in many infections, are practically identical and seem to point to a uniform primary medial degeneration in these diseases and in certain other intoxications not of bacterial origin.

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[52] Amer. Jour. Med. Sci., 1907, cxxxii, 737.

[53] Ibid., 1902, cxxiii, 10.

The growth in knowledge of arteritis in the young, from the early gross observations of rare and accidental instances up to recent systematic and refined study, may, it seems, prove of distinct assistance in our comprehension of early developments in adult life. Whatever the arterial sequels of the acute infections may prove to be, their effect must be intensified by the commonly recognized causes, and these factors combined would develop early and abnormal expressions of degeneration, termed presenile, the primary etiology of some of which has never appeared entirely clear and satisfactory.

LACK OF GASTRIC MUCUS (AMYXORRHŒA GASTRICA) AND ITS RELATION TO HYPERACIDITY AND GASTRIC ULCER.

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Of late a number of articles have been published which deal with the physiological and pathological secretion of gastric mucus and have given a fresh impetus to the long-neglected study of these conditions. I wish to report some of my own observations on this subject which will show that the secretion of gastric mucus is a necessary function, and that lack of mucus leads to serious disturbances. For several years I have made notes on the amount of mucus found in stomach contents. Of the interesting results thereby obtained, I shall confine myself to describing a frequent finding, that is, a complete lack of mucus in the gastric contents, a condition which is pathological and which has not been described heretofore.

The reason that this condition has not been recognized is that, as a rule, the contents of a fasting stomach, gained by expression or lavage, are used for the clinical examination of mucus. In this way, however, we can only detect an abnormal increase of mucus. Although it seems that in the stomach mucus is constantly secreted to some extent, its secretion is principally connected with the digestive period. The wash water of a fasting normal stomach does not show any mucus or only small quantities. Whenever we find, in